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New combinations in *Odontostemma* (Caryophyllaceae)

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Abstract

Sixty-three new combinations in *Odontostemma* (Alsineae, Caryophyllaceae) are made to accommodate placement of all currently recognized taxa of *Arenaria* subg. *Odontostemma* within the genus *Odontostemma*.

Keywords

Odontostemma, *Arenaria*, Caryophyllaceae, nomenclature

Introduction

In their study of relationships in *Arenaria* L. and major lineages within the Alsinoideae using nuclear and plastid DNA, Harbaugh et al. (2010) found that three members of *A.* subg. *Odontostemma* (Benth. ex G. Don) F.N. Williams clustered in a clade with *Pseudostellaria* Pax and *Lepyrodiclis* Fenzl, distinct from most of *Arenaria* s.s., instead clustering more closely with *Stellaria* L. and *Cerastium* L. This alignment was also seen in the broad study of family relationships by Greenberg and Donoghue (2011).

Sadeghian et al. (2015) completed the most recent and more comprehensive analyses of *Arenaria* in the broad sense. They confirmed the results of Harbaugh et al. (2010)

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and Greenberg and Donoghue (2011), showing that *Arenaria* s.s. and *Eremogone* Fenzl are in different clades and are each monophyletic and that *Arenaria* subg. *Odontostemma* is in a third clade separate from those including *Arenaria* s.s. and *Eremogone*; *Odontostemma* is also monophyletic. In addition, *Arenaria* subg. *Solitaria* McNeill is sister to *Odontostemma* and subg. *Dolophragma* (Fenzl) McNeill appears distantly related to any *Arenaria* species; both of these subgenera should also be excluded from *Arenaria* and treated as distinct genera.

With only seven names currently available in *Odontostemma* (six provided by Sadeghian et al. (2015) for species they sampled), nearly all members of *Arenaria* subg. *Odontostemma* require new combinations in *Odontostemma*. With active flora projects in India (Flora of India Checklist, in prep.) and China (Flora of China, e.g. Wu et al. 2001) bringing more information to light about these areas, we feel that it is time to supply the 63 combinations necessary for recognizing remaining taxa as members of the genus *Odontostemma*.

Methods

The information about type specimens of the basionyms of the new combinations that we have included is based on examining protologues and searching major indices (Tropicos - http://www.tropicos.org/; JSTOR Global Plants - https://plants.jstor.org; Chinese Virtual Herbarium (CVH), http://www.cvh.org.cn), as well as websites of several individual herbaria (B [http://ww2.bgbm.org/herbarium/default.cfm], E [http://elmer.rbge.org.uk/bgbase/vherb/bgbasevherb.php], K [http://apps.kew.org/herbcat/navigator.do?_ga=1.234000091.472586779.1455676163], P [https://science.mnhn.fr/institution/mnhn/collection/p/item/search] , US [http://collections.nmnh.si.edu/search/botany/?ti=3], and WU [http://herbarium.univie.ac.at/database/search.php]) for extant specimens. We also examined images of specimens at A which had not been included in JSTOR and at KUN for twenty-one taxa where information in the CVH appeared to be incomplete. Herbarium abbreviations follow *Index Herbariorum* (Thiers 2016, continuously updated, http://sweetgum.nybg.org/science/ih/). We have examined a digital image from one (or more) of these sources for any specimen for which we cite a barcode in the type citations. In cases where specimen deposition is not clearly stated in a protologue, we have added "?" after the abbreviation where, based on information about the location of the herbarium where the author worked and/or deposited their herbaria (see Index of Botanists - http://kiki.huh.harvard.edu/databases/botanist_index.html), we expect, but cannot confirm, a type specimen should have been deposited.

In the cases where syntypes are cited, we have refrained from designating lectotypes. It is not a requirement for the names to be validly and effectively published and we consider those decisions should be made during the course of a taxon-level revision where a serious study of all specimens would lead to the best selections.

Discussion

Odontostemma Benth. ex G. Don was originally described by Bentham to segregate *O. glandulosum* Benth. ex G. Don from *Arenaria* (Don 1831). Most subsequent authors have included *Odontostemma* in *Arenaria*, most recently as a subgenus (McNeill 1962, Wu et al. 2001). *Arenaria* subg. *Odontostemma* includes about 65 species (Wu et al. 2001), all native to eastern Asia with 57 species endemic to China (Wu et al. 2001). Wu et al. (2001) noted that species have sometimes been grouped into five sections (two of which have not been validly published); Sadeghian et al. (2015) suggested it is premature to suggest subdividing the genus pending additional taxon sampling.

Odontostemma taxa can be recognized by a combination of characters. Most members have two, or seldom three (or more in one species), styles, sepals that curve outward distally and are saccate proximally with truncate or acute apices, and seeds with an inflated testa that lacks reticulate striations. If one were to apply the generic segregations reported in Sadeghian et al. (2015) to the Wu et al. (2001) treatment of *Arenaria* in China, the 102 species would be distributed among five genera, with *Arenaria* comprising just six species. A key to these genera, based in part on McNeill (1962) and Wu et al. (2001), follows:

Key to *Arenaria* and segregate genera

1 Styles 2 (seldom 3; 4(5) in *O. weissianum*), capsule valves 4 (seldom 6; 8(10) in *O. weissianum*); plants diffuse **2**

– Styles 3, capsule valves 6 (rarely styles 2 and capsule valves 4, then plants densely pulvinate [some *Arenaria* subg. *Dicranilla* (Fenzl) F.N. Williams]); plants diffuse, caespitose, or pulvinate **3**

2 Sepals often curved outward distally, often saccate proximally, obscurely veined, apex truncate or acute; seeds usually inflated, roughened, surface obscurely marked; east Asia ..... ***Odontostemma***

– Sepals straight, not saccate proximally, veins prominent, apex acute-acuminate or obtuse; seeds not inflated, surface often roughened and tuberculate; France [*Arenaria provincialis* Chater & G. Halliday] ..... ***Arenaria*** (in part)

3 Plants densely caespitose or pulvinate **4**

– Plants diffuse, sometimes weakly caespitose **6**

4 Sepals thickened proximally, veins 1-3, prominent ..... ***Eremogone*** (in part)

– Sepals not thickened proximally, veins indistinct **5**

5 Plants densely caespitose but not pulvinate; cauline leaves sometimes overlapping, but not decussate; flowers solitary, rarely in pairs; sepal apex and margins hardened ..... ***Solitaria***

– Plants densely pulvinate (rarely densely caespitose); cauline leaves decussate in 4 rows; flowers solitary or in three-flowered cymes; sepal apex and margins scarious, but not hardened ..... ***Dolophragma***

6 Leaves filiform to subulate, often grass-like, or short and needle-like with margins often white-scarious; sepals thickened proximally, veins often prominent ..... ***Eremogone*** (in part)

– Leaves linear to ovate to orbicular, neither grass-like nor needle-like, margins not scarious; sepals not or barely thickened proximally, veins obscure or prominent ..... ***Arenaria*** (in part)

The name Odontostemma is a compound word formed from *odont*, Greek, tooth, and *stemma*, Greek, wreath or garland. Although Odontostemma appears to be feminine, the gender must be treated as neuter. According to Article 62.2 (see esp. 62.2(c)) of the International Code of Nomenclature (McNeill et al. 2012), a compound genus name takes the gender of the last element; *-stemma* is neuter.

This detail was apparently overlooked when five of the new combinations were made in Sadeghian et al. (2015). Article 32.2 of the International Code (McNeill et al. 2012) allows these names to be corrected "without change of the author citation or date". These names should now be cited as follows: *Odontostemma barbatum* (Franch.) Sadeghian & Zarre, *Odontostemma ionandrum* (Diels) Sadeghian & Zarre, *Odontostemma pogonanthum* (W.W. Sm.) Sadeghian & Zarre, *Odontostemma roseiflorum* (Sprague) Sadeghian & Zarre, and *Odontostemma trichophorum* (Franch.) Sadeghian & Zarre.

Taxonomic treatment

Odontostemma Benth. ex G. Don

Odontostemma Benth. ex G. Don, Gen. Hist. 1: 449. 1831
Arenaria subg. *Odontostemma* (Benth. ex G. Don) F.N. Williams, Bull. Herb. Boissier 3: 603. 1895.
Gooringia F.N. Williams, Bull. Herb. Boissier 5: 530. 1897.

Type. *Odontostemma glandulosum* Benth. ex G. Don, Gen. Hist. 1: 449. 1831

Description. Herbs annual, biennial, or perennial, diffuse, not pulvinate. Leaf blades linear to ovate, rarely subulate. Inflorescences cymose, terminal or sometimes axillary, the flowers often borne on long pedicels. Sepals often curved outward distally, often saccate, veins inconspicuous, margin membranous, apex truncate or acute. Petals usually longer than sepals (sometimes shorter, when cleistogamous flowers present), apex emarginate or shallowly bifid or toothed. Styles 2, seldom 3 [4(5) in *O. weissianum*]. Seeds often inflated, roughened, without reticulate striations.

About 65 species: Asia; 59 species (57 endemic) in China.

New combinations

Odontostemma amdoense **(L.H. Zhou) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155278-1

Arenaria amdoensis L.H. Zhou in C.Y. Wu, Fl. Xizang. 1: 688. 1983.

Type. China: Xizang: river beaches, Ando Xian, 4830 m, Qinghai-Xizang Freezing-soil Complex Exped. 551 (holotype, NWBI, not seen).

Odontostemma auricomum **(Y.W. Tsui ex L.H. Zhou) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155279-1

Arenaria auricoma Y.W. Tsui ex L.H. Zhou, Acta Biol. Plateau Sin. 6: 31. 1987.

Type. China: Yunnan: mountain sands, Zhongdian, 4200–4750 m, 1 September 1962, Zhongdian Exped. 1831 (holotype KUN, KUN0510342; isotype, KUN, KUN1205404).

Odontostemma barbatum **(Franch.) Sadeghian & Zarre var. hirsutissimum (W.W. Sm.) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155332-1

Arenaria barbata var. *hirsutissima* W.W. Sm., Notes Roy. Bot. Gard. Edinburgh 11: 195. 1920.

Type. China: Yunnan: dry open stony mountain meadows, eastern flank, Lijiang Range, 3350–3650 m, 27°40'N, August 1910, G. Forrest 6299 (holotype, E, E00313712; isotype, K, K000723902).

Odontostemma bomiense **(L.H. Zhou) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155280-1

Arenaria bomiensis L.H. Zhou in C.Y. Wu, Fl. Xizang. 1: 685. 1983.

Type. China: Xizang: mountain grasslands, Bomi, ca. 3700 m, P.C. Tsoong 6347 (holotype, PE, not seen).

Odontostemma chamdoense **(C.Y. Wu ex L.H. Zhou) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155281-1

Arenaria chamdoensis C.Y. Wu ex L.H. Zhou in S.W. Liu, Fl. Qinghai. 1: 506. 1997.

Type. China: Xizang: on gravel, Chamdo (Sheezha), 4600 m, 24 August 1976, C.Y. Wu 5033 (holotype, KUN, KUN1205408; isotype, KUN, KUN1207757).

Odontostemma delavayi **(Franch.) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155282-1

Arenaria delavayi Franch., Bull. Soc. Bot. France 33: 432. 1886.

Type. China: Yunnan: in rock clefts near summit of Mt. Tsang-chan, above Tali, 4000 m, P.J.M. Delavay 1039 (holotype P, P01902938; isotypes: P [2 sheets], P01902939, P01902940).

Odontostemma dimorphitrichum **(C.Y. Wu ex L.H. Zhou) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155283-1

Arenaria dimorphitricha C.Y. Wu ex L.H. Zhou, Acta Biol. Plateau Sin. 6: 28. 1987.

Type. China: Sichuan: margin of woods, grassy slope, Mu-li, Gi-bo-shan, 2800 m, 7 August 1937, F.I.B. Yunnan Exp., T.T. Yü 7644 (holotype, KUN, KUN1205413; isotype, A, A00235507).

Odontostemma dsharaense **(Pax & K. Hoffm.) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155284-1

Arenaria dsharaensis Pax & K. Hoffm. in Pax, Repert. Spec. Nov. Regni Veg. Beih. 12: 366. 1922.

Type. China: East Tibet: along creeks near snow patches, Ta tsien lu, west chain of Dshara parallel, east Chung ku, 4700 m, H.W. Limpricht 1818 (holotype, WRSL?; isotype WU, WU0046569).

***Odontostemma euodontum* (W.W. Sm.) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155285-1

Arenaria euodonta W.W. Sm., Notes Roy. Bot Gard. Edinburgh 11: 195. 1920.

Syntypes. China: Yunnan: open situations on and amongst boulders, Kari Pass, Mekong-Yangtze Divide, 3960 m, 27°40'N, July 1914, G. Forrest 12891 (syntype, E, E00313702; isosyntypes, KUN, KUN0510655 [labeled "holotype"]), PE, PE00551428); China: SE Tibet: open stony pasture and screes, on Doker-La, Mekong-Salween Divide, 28°20'N, August 1917, G. Forrest 14640 (syntype, E, E00316014; isosyntype, K, K000723895).

***Odontostemma filipes* (C.Y. Wu ex L.H. Zhou) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155286-1

Arenaria filipes C.Y. Wu ex L.H. Zhou, Acta Biol. Plateau Sin. 6: 34. 1987.

Type. China: Sichuan: wooded margins, Mu-li, Gi-bo-shan, 2800 m, 7 August 1937, F.I.B. Yunnan Exp., T.T. Yü 7637 (holotype, KUN, KUN1205418; isotypes, A, A00235539, KUN, KUN1205415, PE [2 sheets], PE00551451, PE00551452).

***Odontostemma fimbriatum* (Mattf.) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155333-1

Arenaria fimbriata Mattf., Notizbl. Bot. Gart. Berlin-Dahlem 11: 335. 1932; *Cerastium fimbriatum* E. Pritz., Bot. Jahrb. Syst. 29: 320. 1900, not Ledeb. (1815), nom. illeg.

Syntypes. China: Sichuan?: highest regions, Tai pa Shan, August, Giraldi 1187 (B, presumably destroyed), Giraldi 1188 (B, presumably destroyed).

***Odontostemma giraldii* (Diels) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155287-1

Lepyrodiclis giraldii Diels, Bot. Jahrb. Syst. 36 (Beibl. 82): 38. 1905; *Arenaria giraldii* (Diels) Mattf., Notizbl. Bot. Gart. Berlin-Dahlem 11: 336. 1932.

Type. China: Shaanxi?: Im Ki shan, 65 km SE of Sce kin Tsuen, Giraldi 2599 (B, presumably destroyed).

Odontostemma inconspicuum **(Hand.-Mazz.) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155288-1

Arenaria inconspicua Hand.-Mazz., Symb. Sin. 7: 197. 1929.

Syntypes. China: Yunnan: bare, muddy, mica and granite areas, Mekong-Salwin-Kette, back Pongatong, 28°9'N, 4300-4375 m, 4 August 1916, H. Handel-Mazzetti 9677 (syntype, WU, WU0043550; isosyntype, K, K000723884); Doker-La, border of Tibet, 4600 m, 17 September 1915, H. Handel-Mazzetti 8146 (syntype, WU, WU0043551).

Odontostemma inornatum **(W.W. Sm.) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155289-1

Arenaria inornata W.W. Sm., Notes Roy. Bot. Gard. Edinburgh 11: 196. 1920.

Type. China: Yunnan: on boulders and ledges of cliffs, Mekong-Salween Divide, 3650 m, 28°12'N, July 1917, G. Forrest 14444 (holotype, E, E00313710; isotype K, K000723894).

Odontostemma ionandrum **(Diels) Sadeghian & Zarre var.** ***melanotrichum*** **(H.F. Comber) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names: 77155335-1

Arenaria ionandra var. *melanotricha* H. F. Comber, Notes Roy. Bot. Gard. Edinburgh 18: 229. 1934.

Type. China: Yunnan: moist chalky pasture, eastern flank of Lijiang Range, 27°35'N, 3350 m, September 1910, G. Forrest 6509, (holotype, E, E00313708; isotypes, ISBC0147277, KUN0511451).

Odontostemma karakorense **(Em. Schmid) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155336-1

Arenaria karakorensis Em. Schmid, Repert. Spec. Nov. Regni Veg. 31: 42. 1932.

Syntypes. China: Xizang: Kiam, 5100 m, 11 August 1927, W. Bosshard s.n. (W, presumed destroyed) ; China: Aksai-Chin, ca. 5000 m, 5 September 1927, W. Bosshard s.n. (W, presumed destroyed).

Odontostemma leucasterium **(Mattf.) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155290-1

Arenaria leucasteria Mattf., Notizbl. Bot. Gart. Berlin-Dahlem 11: 334. 1932.

Type. China: Szechuan: in scree, Mt. Konka, Risonquemba, Konkaling, 5080 m, June-August 1928, J.F. Rock 16847 (holotype, B, presumed destroyed; isotypes, E, E00313707, GH, GH00053922, N [not seen], US, US00103300).

Odontostemma littledalei **(Hemsl.) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155291-1

Arenaria littledalei Hemsl., Bull. Misc. Inform. Kew 1896: 209. 1896. *Gooringia littledalei* (Hemsley) F.N. Williams, Bull. Herb. Boissier 5: 530. 1897.

Type. China: Tibet, Goring Valley, 30°12'N, 90°25'W, 5000 m; St. George R. Littledale s.n. (holotype, K, K000723881).

Odontostemma longicaule **(C.Y. Wu ex L.H. Zhou) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155292-1

Arenaria longicaulis C.Y. Wu ex L.H. Zhou, Acta Biol. Plateau Sin. 6: 38. 1987.

Type. China: Yunnan: 1938, Nat. Pek. Univ. Exped. s.n. (holotype, PE, not seen).

Odontostemma longipes **(C.Y. Wu ex L.H. Zhou) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155293-1

Arenaria longipes C.Y. Wu ex L.H. Zhou, Acta Biol. Plateau Sin. 6: 39. 1987.

Type. China: Sichuan: cliffs, Muli, Shao-siang-liang-tze, ca. 3500 m, 16 August 1937, F.I.B. Yunnan Exp., T.T. Yü 7743 (holotype, KUN, KUN1205431; isotypes, A, A00235717, KUN, KUN0510918, PE [2 sheets], PE00024087, PE00551827).

Odontostemma longipetiolatum **(C.Y. Wu ex L.H. Zhou) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155294-1

Arenaria longipetiolata C.Y. Wu ex L.H. Zhou, Acta Biol. Plateau Sin. 6: 29. 1987.

Type. China: Sichuan: forests, Mu-li, Between Gei-bao-shan and Mu-li-si, 2580 m [2800 m on holotype, transcription error?], 7 August 1937, F.I.B. Yunnan Exp., T.T. Yü 7655 (holotype, KUN, KUN1205433; isotypes, IBSC, IBSC0147267, KUN, KUN1205434, PE [2 sheets], PE00551828, PE 00551829).

Odontostemma longisetum **(C.Y. Wu) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155295-1

Arenaria longiseta C.Y. Wu in C.Y. Wu et al., Fl. Yunnan. 6: 835. 1995.

Type. China: Yunnan: Deqen, 3800-3900 m, 13 August 1940, K.M. Feng 6599 (holotype, KUN, KUN1205436; isotypes, KUN [2 sheets], KUN1205435, KUN1207758).

Odontostemma longistylum **(Franch.) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155337-1

Arenaria longistyla Franch., Bull. Soc. Bot. France 33: 433. 1886.

Type. China: Yunnan: on Mt. Li-kiang, 4000 m, 13 August 1886, P.J.M. Delavay 2103 (holotype, P, P04966773).

Odontostemma longistylum **var.** ***pleurogynoides*** **(Diels) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155339-1

Arenaria longistyla var. *pleurogynoides* Diels, Notes Roy. Bot. Gard. Edinburgh 5: 182. 1912.

Type. China: Yunnan: on limestone drift at base of cliffs, eastern flank of Lijiang Range, 27°20'N, 3650 m, September 1906, G. Forrest 2902 (holotype, E, E00313706; isotype, P, P04966776).

Odontostemma mairei **(H. Lév.) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155296-1

Cerastium mairei H. Lév., Repert. Spec. Nov. Regni Veg. 13: 341. 1914, not *Arenaria mairei* Emb. (1933); *Arenaria iochanensis* C.Y. Wu in C. L. Tang, Fl. Reipubl. Popularis Sin. 26: 241. 1996.

Type. China: Yunnan: on rocks, du lo-Chan summit, 3400 m, August 1913, E. E. Maire s.n. (holotype, E, E00313695).

Odontostemma melanandrum **(Maxim.) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155297-1

Cerastium melanandrum Maxim., Bull. Acad. Imp. Sci. Saint-Pétersbourg, Sér. 3, 26: 429. 1880; *Arenaria melanandra* (Maxim.) Mattf. ex Hand.-Mazz., Symb. Sin. 7: 202. 1929.

Type. China: Kansu, 1873, Przewalski s.n. (LE?).

Odontostemma melandryiforme **(F.N. Williams) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155298-1

Arenaria melandryiformis F.N. Williams, J. Linn. Soc., Bot. 38. 399. 1909.

Syntypes. China: Xizang, Beong-chin, W of Chumbi, 1882, King's collector 1127 (K, K000742175); China: Xizang, Syam-poo, Chumbi district, 1884, King's collector 123 (K, K000742176).

Odontostemma melandryoides **(Edgew.) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155299-1

Arenaria melandryoides Edgew. in Hook.f., Fl. Brit. India 1: 241. 1874.

Type. India: Sikkim, alt. 4260-5480 m, J. D. Hooker 13 (holotype, K?, not seen; isotype, GH, GH00037640).

Odontostemma membranisepalum **(C.Y. Wu) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155300-1

Arenaria membranisepala C.Y. Wu in C.Y. Wu et al., Fl. Yunnan. 6: 155, Addenda 835. 1995.

Type. China: Yunnan: Lijiang?, C.Y. Wu & D.Y. Leu 21238 (holotype, KUN, KUN1205438).

Odontostemma minimum **(C.Y. Wu ex L.H. Zhou) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155301-1

Arenaria minima C.Y. Wu ex L.H. Zhou, Acta Biol. Plateau Sin. 6: 35. 1987.

Type. China: Sichuan: mountain rock slope, Muli, Wachin, Jin-chang, 4000 m, 27 October 1937, F.I.B. Yunnan Exp., T.T. Yü 14649 (holotype: KUN, KUN0510991).

Odontostemma monanthum **(F. N. Williams) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155302-1

Arenaria monantha F.N. Williams, J. Linn. Soc., Bot. 38: 401. 1909.

Type. China: Xizang: hills above Lhassa, August 1904, H.J. Walton 1138 (holotype, K, K000723880; isotype, BM, BM000946346).

Odontostemma moniliferum **(Mattf.) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155303-1

Arenaria monilifera Mattf., Notizbl. Bot. Gart. Berlin-Dahlem 11: 334. 1932.

Type. China: Xizang: Tongolo, 17 June 1894, J.A. Soulié 2507b (holotype, B, presumed destroyed).

Odontostemma napuligerum **(Franch.) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155304-1

Arenaria napuligera Franch., Bull. Soc. Bot. France 33: 429. 1886.

Syntypes. China: Yunnan, in rock clefts, Mt. Koua-la-po, near Hokim, 26 April 1884, P. J. M. Delavay 87 (syntypes, P [3 sheets], P01902952, P01902953, P01902954; isosyntypes, K, K000723890, KUN, KUN0511009); along rocky road to Yen-tze-hay, near Lankong, 2500 m, P. J. M. Delavay 1665 (syntypes, P [3 sheets], P01902955, P01902956, P01902957; isosyntype, K, K000723891).

***Odontostemma napuligerum* var. *monocephalum* (W.W. Sm.) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155341-1

Arenaria napuligera var. *monocephala* W.W. Sm., Notes Roy. Bot. Gard. Edinburgh 11: 196. 1920.

Type. China: Xizang: at Ka-gwr-pw temple, near the Yunnan frontier, in alpine turf on precipices, 4725 m, July 1913, F.K. Ward 814 (holotype, E, E00313701).

***Odontostemma nigricans* (Hand.-Mazz.) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155305-1

Arenaria nigricans Hand.-Mazz., Symb. Sin. 7: 196. 1929.

Type. China: Yunnan: between saddles of Mt. Lamatso, between Yungning and Dschungdien (Zhongdian?), dry limestone cliffs, 3200 m, 12 August 1915, H. Handel-Mazzetti 7609 (holotype, WU, WU0043552; isotype, E, E00313704).

Odontostemma nigricans var. zhenkangense (C.Y. Wu ex L.H. Zhou) Rabeler & W.L. Wagner, comb. nov.
urn:lsid:ipni.org:names:77155342-1

Arenaria zhenkangensis C.Y. Wu ex L.H. Zhou, Acta Biol. Plateau Sin. 6: 36. 1987; *Arenaria nigricans* var. *zhenkangensis* (C.Y. Wu ex L.H. Zhou) C.Y. Wu in C. L. Tang, Fl. Reipubl. Popularis Sin. 26: 209. 1996.

Type. China: Yunnan: on rocky slope, Zhengkang, Snow Range, Hsiaoshiishan, 2850 m [2500 m on holotype (transcription error?), 2 August 1938, F.I.B. Yunnan Exp., T.T. Yü 17133 (holotype, KUN, KUN1205466; isotypes, KUN, KUN1205463, PE, PE00024079).

Odontostemma nivalomontanum **(C.Y. Wu ex L.H. Zhou) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155306-1

Arenaria nivalomontana C.Y. Wu ex L.H. Zhou, Acta Biol. Plateau Sin. 6: 29. 1987.

Type. China: Yunnan: on rocky slope, Zhangkang, Xueshang, 2900 m, 31 July 1938, F.I.B. Yunnan Exp., T.T. Yü 17125 (holotype, KUN, KUN0511016); isotypes, PE [2 sheets], PE00551915, PE00551916).

Odontostemma omeiense **(C.Y. Wu ex L.H. Zhou) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155307-1

Arenaria omeiensis C.Y. Wu ex L.H. Zhou, Acta Biol. Plateau Sin. 6: 30. 1987.

Type. China: Sichuan: under thickets, Omei-hsien, Mt. Omei, ca. 3100 m, 5 August 1938, W.P. Fang 12979 (holotype, KUN, KUN0511017; isotype, A00235605]).

Odontostemma paramelanandrum **(H. Hara) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155308-1

Arenaria paramelanandra H. Hara, J. Jap. Bot. 52: 193. 1977.

Type. Nepal: Chakure Lekh, S of Jumla, 14000 ft, 21 July 1952, O. Polunin, W.R. Sykes, & L.H.J. Williams 4827 (holotype, BM, BM000521527).

Odontostemma pharense **(McNeill & Majumdar) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155309-1

Arenaria pharensis McNeill & Majumdar, Bot. J. Linn. Soc. 80: 373. 1980.

Type. China: Xizang: Phari plain, 4360 m, 14 October 1928, J. C. Dawa 398 (holotype, CAL, photo of holotype, DAO; isotype K, K000742178, photo of isotype, DAO).

Odontostemma polyspermum **(C.Y. Wu ex L.H. Zhou) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155310-1

Arenaria polysperma C.Y. Wu ex L.H. Zhou, Acta Biol. Plateau Sin. 6: 33. 1987.

Type. China: Yunnan: side of mountain stream, Upper Kiukiang Valley, (Clulung) Chialahmuto, 3700 m, 7 August 1938, F.I.B. Yunnan Exp., T.T. Yü 19742, (holotype, KUN, KUN1205439; isotypes, A, A00235512, PE [3 sheets], PE00551959, PE00551960, PE00551961).

***Odontostemma pseudostellaria* (C.Y. Wu, L.H. Zhou & W.L. Wagner) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155311-1

Arenaria pseudostellaria C.Y. Wu, L.H. Zhou & W.L. Wagner, Fl. China 6: 59. 2001. *Arenaria linearifolia* Franch., Pl. Delavay. 97. 1889, not Poiret (1804), nor Desvaux (1816); *Moehringia linearifolia* (Franch.) F.N. Williams, J. Linn. Soc., Bot. 34: 437. 1899; *Moehringella linearifolia* (Franch.) H. Neumayer, Verh. Zool.-Bot. Ges. Wien 73: 14. 1923.

Type. China: Yunnan: in woods, Fang-yang-tchang, above Mo-so-yn, 3000 m, 17 June 1887, P.J.M. Delavay 2899 (holotype, P, P04987073).

***Odontostemma quadridentatum* (Maxim.) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155312-1

Lepyrodiclis quadridentata Maxim., Fl. Tangut. 84. 1889; *Arenaria quadridentata* (Maxim.) F.N. Williams, J. Linn. Soc., Bot. 33: 432. 1898.

Type. China: Qinghai: Danube-ngvarsi valley, 16 May 1885, G.N. Potanin s.n. (LE, not seen).

***Odontostemma reductum* (Hand.-Mazz.) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155313-1

Arenaria reducta Hand.-Mazz., Kaiserl. Akad. Wiss. Wien, Math.-Naturwiss. Kl., Anz. 57: 47. 1920.

Type. China: Yunnan: alpine meadows on the W side of Mt. Piepun, SE of Dschungdien, 4400-4650 m, 11 August 1914, H. Handel-Mazzetti, 4725 (holotype, WU, WU0043553).

***Odontostemma rockii* (Diels) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155314-1

Arenaria rockii Diels, Notizbl. Bot. Gart. Berlin-Dahlem 9: 1027. 1926.

Type. China: Yunnan: in limestone gravel, eastern slopes of Mount Dyinaloko, northern peak of the Likiang Snow Range, 4725 m, August 1923, J.F. Rock 10398 (holotype, B, presumably destroyed; isotype, US, US00103309).

***Odontostemma saginoides* (Maxim.) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155343-1

Arenaria saginoides Maxim., Fl. Tangut. 89. 1889.

Type. China: northeastern Tibet, on rocks, 3960 m, 9 July 1884, C.J. Maximowicz? (LE?, not seen).

***Odontostemma salweenense* (W.W. Sm.) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155315-1

Arenaria salweenensis W.W. Sm., Notes Roy. Bot. Gard. Edinburgh 12: 194. 1920.

Type. China: Yunnan: on stony pasture and humus-covered boulders in side valleys, Maikha-Salween Divide, 26°25'N, 3050 m, August 1919, G. Forrest 18474 (holotype, E [mounted on 2 sheets], E00117725 & E00117578; isotypes, K, K000723893, KUN, KUN0511179, WSY [2 sheets], WSY0062587, WSY0095442).

***Odontostemma schneiderianum* (Hand.-Mazz.) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155316-1

Arenaria schneideriana Hand.-Mazz., Kaiserl. Akad. Wiss. Wien, Math.-Naturwiss. Kl., Anz. 57: 46. 1920.

Type. China: Yunnan: in gravelly limestone, W side of Mt. Piepun, SE of Dschungdien (Zhongdian?), 4400-4700 m, 11 August 1914, H. Handel-Mazzetti, 4724 (holotype, WU, WU0043554; isotypes, E, E00313696, KUN, KUN0511180).

Odontostemma setiferum **(C.Y. Wu ex L.H. Zhou) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155317-1

Arenaria setifera C.Y. Wu ex L.H. Zhou, Acta Biol. Plateau Sin. 6: 37. 1987.

Type. China: Yunnan: Bijiang, open slope, Chih-tse-lo, 4000 m, 4 September 1933, H.T. Tsai 54133 (holotype, KUN, KUN0511301; isotype, A, A00235713).

Odontostemma spathulifolium **(C.Y. Wu ex L.H. Zhou) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155318-1

Arenaria spathulifolia C.Y. Wu ex L.H. Zhou, Acta Biol. Plateau Sin. 6: 35. 1987.

Type. China: Yunnan: open hillside, N flank of Haba Snow Range, 3500-4200 m, 20 August 1939, K.M. Feng 2082 (holotype, KUN, KUN0511307; isotypes, A, A00235684, KUN, KUN1205447).

Odontostemma szechuense **(F.N. Williams) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155344-1

Arenaria szechuensis F.N. Williams, J. Linn. Soc., Bot. 34: 437. 1899.

Type. China: Sichuan: Tachien-lu, 1893, J.A. Soulié 814 (holotype, K, K000723892).

Odontostemma thangoense **(W.W. Sm.) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155319-1

Arenaria thangoensis W.W. Sm., Rec. Bot. Surv. India 4: 180. 1911.

Type. India: Thango, 13000-14000 ft.; W.W. Smith 2572 (E?, not seen).

Odontostemma trichophyllum **(C.Y. Wu ex L.H. Zhou) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155320-1

Arenaria trichophylla C.Y. Wu ex L.H. Zhou, Acta Biol. Plateau Sin. 6: 27. 1987.

Type. China: Yunnan: grassy slope, Mu-li, Hwa-to, 3900 m, 28 July 1937, F.I.B. Yunnan Exp., T.T. Yü 7428 (holotype, KUN, KUN1205449; isotype, KUN, KUN0511370).

Odontostemma tumengelaense **(L.H. Zhou) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155321-1

Arenaria tumengelaensis L.H. Zhou, Acta Phytotax. Sin. 18: 357. 1980.

Type. China: Xizang: riverside grasslands, Tumengela Colliery, 5000 m, 30 July 1963, J.X. Yang 1993 (holotype, WUK, WUK0215558; isotypes, KUN [2 sheets], KUN1205455, KUN1205458).

Odontostemma weissianum **(Hand.-Mazz.) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155322-1

Arenaria weissiana Hand.-Mazz., Kaiserl. Akad. Wiss. Wien, Math.-Naturwiss. Kl., Anz. 57: 47. 1920.

Syntypes. China: Yunnan: in gravelly limestone, W side of Mt. Piepun, SE of Ds-chungdien (Zhongdian?), 4300–4650 m, 11 August 1914, H. Handel-Mazzetti 4682 (syntype, WU, WU0043555); China: Yunnan: Mt. Yulung-schan, near Lidjiang ("Likiang"), no date given, H. Handel-Mazzetti 3657 (syntype, WU, WU0043557), same location, H. Handel-Mazzetti 3698 (syntype, WU, WU0043556; isosyntype, E, E00313715).

Odontostemma weissianum **var.** ***bifidum*** **(C.Y. Wu & H. Chuang) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155326-1

Arenaria weissiana var. *bifida* C.Y. Wu & H. Chuang in C.Y. Wu et al, Fl. Yunnan. 6: 836. 1995.

Type. China: Yunnan: mountain slope, Huann-fu-ping, A-tun-tze, August 1935, C.W. Wang 68878 (holotype, KUN, KUN1205457; isotypes, A, A00235698, PE [2 sheets], PE00574388, PE00574392).

Odontostemma weissianum **var.** ***puberulum*** **(C.Y. Wu ex L.H. Zhou) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155327-1

Arenaria weissiana var. *puberula* C.Y. Wu ex L.H. Zhou, Acta Biol. Plateau Sin. 6: 34. 1987.

Type. China: Sichuan: cliffs, Mu-li, Hwa-to, 3900 m, 28 July 1937, F.I.B. Yunnan Exp., T.T. Yü 7432, (holotype, KUN, KUN1205460; isotypes, KUN, KUN1205459, PE [2 sheets], PE00025036, PE00574410).

***Odontostemma xerophilum* (W.W. Sm.) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155323-1

Arenaria xerophila W.W. Sm., Notes Roy. Bot. Gard. Edinburgh 11: 198. 1920.

Syntypes. China: Yunnan: limy pasture and ledges of limestone cliffs, mountains in N.E. of Yangzi bend, 3050 m, 27°45'N, September 1913, G. Forrest 10998 (syntype, E, E00313694; isosyntypes, K, K000723889, KUN, KUN0511441, PE, PE00574412); China: Yunnan: open dry pasture, Atuntze valley, 28°28'N, August 1914, G. Forrest 13210 (E, not seen; isosyntypes, ISBC, not seen, PE, PE00574414).

***Odontostemma xerophilum* var. *xiangchengense* (L.H. Zhou) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155345-1

Arenaria xiangchengensis L.H. Zhou, Acta Biol. Plateau Sin. 6: 36. 1987; *Arenaria xerophila* var. *xiangchengensis* (L.H. Zhou) C.Y. Wu in W. T. Wang et al., Vasc. Pl. Hengduan Mount. 1: 404. 1993.

Type. China: Sichuan: margin of pine forest, Xiangcheng, Tungzung, 3000 m, 20 September 1937, F.I.B. Yunnan Exp., T.T. Yü 13403 (holotype, KUN, KUN0511449; isotypes, A, A00235702, PE, PE00574411).

***Odontostemma yulongshanense* (L.H. Zhou ex C.Y. Wu) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155346-1

Arenaria yulongshanensis L.H. Zhou ex C.Y. Wu in W. T. Wang et al., Vasc. Pl. Hengduan Mount. 1: 410. 1993; *Arenaria trichophora* Franch. var. *angustifolia* Franch., Pl. Delavay. 95. 1889, not *A. angustifolia* McNeill (1961).

Type. China: Yunnan: limestone rocks on snowy ridges, Likiang, 4000 m, 14 Aug 1886, P.J.M. Delavay 2480 (holotype, P, P01902968; isotypes K, K000723899, P [3 sheets], P01902969, P01902970, P01902971).

Odontostemma yunnanense **(Franch.) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155324-1

Arenaria yunnanensis Franch., Bull. Soc. Bot. France 33: 431. 1886.

Type. China: Yunnan: in shady rock clefts, near summit of Mt. Pengay-tze, above Houang-kia-pin, 4 Sep 1882, P.J.M. Delavay 8 (holotype, P, P01902976; isotypes, BM, BM00946351, E, E00313693, K, K000723900, KUN, KUN0511455, P [5 sheets], P01902977, P01902978, P01902980, P01902981, P01902982).

Odontostemma yunnanense **var.** ***caespitosum*** **(C.Y. Wu) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155328-1

Arenaria yunnanensis var. *caespitosa* C.Y. Wu in C.Y. Wu et al., Fl. Yunnan. 6: 835. 1995.

Type. China: Yunnan: Deqen, 10 July 1940, K.M. Feng 5278 (holotype, KUN, KUN1205462; isotypes, KUN [2 sheets], KUN1205461, KUN1205464, PE, PE00574440).

Odontostemma zhongdianense **(C.Y. Wu) Rabeler & W.L. Wagner, comb. nov.**
urn:lsid:ipni.org:names:77155325-1

Arenaria zhongdianensis C.Y. Wu in C.Y. Wu et al., Fl. Yunnan. 6: 152, Addenda 835. 1995.

Type. China: Yunnan: Zhongdian, 3300 m, 14 August 1962, Zhongdian Exp. 832 (holotype, KUN, KUN1205465; isotypes, KUN [2 sheets], KUN1205467, KUN1205468).

Excluded taxa

Arenaria longistyla var. *eugonophylla*

Although appearing in Wu et al. (2001) and attributed to Fernald as published in Rhodora 21: 5. 1919, this name does not appear on that page and we have not been able to locate a place of publication.

Arenaria microstella C.Y. Wu in C. L. Tang, Fl. Reipubl. Popularis Sin. 26: 213. 1996.

This taxon is likely related to *O. bomiense* (Wu et al. 2001). It was described in Chinese, thus was invalidly published, and was mentioned, but not validly published, by Wu et al. (2001).

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References

Don G (1831) A General History of the Dichlamydeous Plants (Vol. 1). J.G. and F. Rivington, London. doi: 10.5962/bhl.title.21964

Greenberg AK, Donoghue MJ (2011) Molecular systematics and character evolution in Caryophyllaceae. Taxon 60: 1637–1652.

Harbaugh DT, Nepokroeff M, Rabeler RK, McNeill J, Zimmer EA, Wagner WL (2010) A new lineage-based tribal classification of the family Caryophyllaceae. International Journal of Plant Science 171: 185–198. doi: 10.1086/648993

McNeill J (1962) Taxonomic studies in the Alsinoideae: I. Generic and infra-generic groups. Notes from the Royal Botanic Garden, Edinburgh 24: 79–155.

McNeill J, Barrie FR, Buck WR, Demoulin V, Greuter W, Hawksworth DL, Herendeen PS, Knapp S, Marhold K, Prado J, Prud'homme van Reine WF, Smith GF, Wiersema JH, Turland NJ (2012) International Code of Nomenclature for algae, fungi, and plants (Melbourne Code) adopted by the Eighteenth International Botanical Congress Melbourne, Australia, July 2011. Koeltz Scientific Books, Königstein, Germany. [Regnum Veg. 154]

Röpert D (2016) Digital specimen images at the Herbarium Berolinense. http://ww2.bgbm.org/herbarium/default.cfm [accessed 15 Feb 2016]

Sadeghian S, Zarre S, Rabeler RK, Heubl G (2015) Molecular phylogeny of *Arenaria* (Caryophyllaceae: tribe Arenarieae) and its allies inferred from nuclear DNA ITS and plastid DNA rps16 sequences. Botanical Journal of the Linnaean Society 178: 648–669. doi: 10.1111/boj.12293

Thiers B (2016) Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. http://sweetgum.nybg.org/ih/ [continuously updated]

Wu CY, Zhou L, Wagner WL (2001) *Arenaria*. In: Wu CY, Raven PH, Hong DY (Eds) Flora of China, volume 6. Science Press, Beijing & Missouri Botanical Garden Press, St. Louis, 40–66.